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**Effective delivery of stem cells using an extracellular matrix patch results in increased cell survival and proliferation and reduced scarring in skin wound healing.**

**Journal:** Tissue Eng Part A

**Publication Year:** 2012

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**PubMed link:** 23072446

**Funding Grants:** The HSU CIRM Bridges to Stem Cell Research Certificate Program

**Public Summary:**

Wound healing is one of the most complex biological processes and occurs in all tissues and organs of the body. In humans, fibrotic tissue, or scar, hinders function and is aesthetically unappealing. Stem cell therapy offers a promising new technique for aiding in wound healing, however current findings show that stem cells typically die and/or migrate from the wound site, greatly decreasing efficacy of the treatment. Here, we demonstrate effectiveness of a stem cell therapy for improving wound healing in the skin and reducing scarring by introducing stem cells using a natural patch material. Adipose-derived stromal cells (ASCs) were introduced to excisional wounds created in mice using a non-immunogenic extracellular matrix (ECM) patch material derived from porcine small intestine submucosa (SIS). The SIS served as an attractive delivery vehicle because of its natural ECM components, including its collagen fiber network, providing the stem cells with a familiar structure. Experimental groups consisted of wounds with stem cell-seeded patches removed at different time points following wounding to determine an optimal treatment protocol. Stem cells delivered alone to skin wounds did not survive post-transplantation as evidenced by bioluminescence in vivo imaging. In contrast, delivery with the patch enabled a significant increase in stem cell proliferation and survival. Wound healing rates were moderately improved by treatment with stem cells on the patch, however areas of fibrosis, indicating scarring, were significantly reduced in wounds treated with the stem cells on the patch compared to untreated wounds.

**Scientific Abstract:**

Wound healing is one of the most complex biological processes and occurs in all tissues and organs of the body. In humans, fibrotic tissue, or scar, hinders function and is aesthetically unappealing. Stem cell therapy offers a promising new technique for aiding in wound healing, however current findings show that stem cells typically die and/or migrate from the wound site, greatly decreasing efficacy of the treatment. Here, we demonstrate effectiveness of a stem cell therapy for improving wound healing in the skin and reducing scarring by introducing stem cells using a natural patch material. Adipose-derived stromal cells (ASCs) were introduced to excisional wounds created in mice using a non-immunogenic extracellular matrix (ECM) patch material derived from porcine small intestine submucosa (SIS). The SIS served as an attractive delivery vehicle because of its natural ECM components, including its collagen fiber network, providing the stem cells with a familiar structure. Experimental groups consisted of wounds with stem cell-seeded patches removed at different time points following wounding to determine an optimal treatment protocol. Stem cells delivered alone to skin wounds did not survive post-transplantation as evidenced by bioluminescence in vivo imaging. In contrast, delivery with the patch enabled a significant increase in stem cell proliferation and survival. Wound healing rates were moderately improved by treatment with stem cells on the patch, however areas of fibrosis, indicating scarring, were significantly reduced in wounds treated with the stem cells on the patch compared to untreated wounds.

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